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TANK CLOSURE (Decommissioning)

Chapter 1: Industry/Regulatory Documents

- API Recommended Practice 1604 – "Closure of Underground Petroleum Storage Tanks" (3rd Edition – 1996)
- NEIWPCC - "Tank Closure Without Tears: An Inspector's Safety Guide" (1988)
- 40CFR Part 280: Subpart G: Section 280.70-74

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Chapter 2: Safety Requirements

Safety Program

- Assign someone within the company to be responsible for safety (Safety Officer)
  - Fire extinguishers
  - Safety goggles
  - Vapor meters
  - Traffic barricades
  - Flagging
  - Signage

- Hold regular company safety meetings (1 hour per week)

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Chapter 2: Safety Requirements

Training Requirements

- Employees must be trained before beginning work
  - Methods to detect hazardous substances
  - Health hazards associated with exposure
  - How to handle hazardous materials
  - Recommended personal protective gear
  - Use of MSDS sheets
  - Special Training (40 hour HAZWOPER)

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Chapter 2: Safety Requirements

OSHA Requirements

- *General Requirements for Personal Protective Equipment,* 29 CFR 1910.132.
- *Eye and Face Protection,* 29 CFR.133(a); ANSI Z87.1-1968.
- *Standard Practice for Respiratory Protection,* 29 CFR 1910.134; ANSI Z88.2-1969.
- *Safety Requirements for Industrial Head Protection,* 29 CFR 1910.135; ANSI ZS9. 1-1069.
- *Men's Safety Toe Footwear,* 29 CFR 1910.136; ANSI Z41.1-1967.
- *Maximum Allowable Slopes [for Trenches and Excavations];* 29 CFR 1926.650-653, Subpart P, U.S. Dept. of Labor

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Chapter 2: Safety Requirements

Areas of Exposure

- Working in unshored excavations
- Demolition
- Pressurized fluids
- Heavy work
- Traffic

- Exposure to flammable & combustible liquids
- Exposure to toxic liquids & vapors
- Confined space entry (OSHA 29 CFR 1910)

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Chapter 2: Safety Requirements

Areas of Exposure

- Confined space entry (OSHA 29 CFR 1910)

CALOSHA - Case: Oxygen deficiency and toxic vapors
Worker dies of asphyxia in toxic vapor-filled gasoline delivery manhole

- In El Monte, California, the body of a worker was found in a gasoline delivery manhole measuring 36 inches in diameter by six feet deep. This was a permit-required confined space.
- The victim had been working in the manhole without any protection and asphyxiated after inhaling gasoline vapors. After an investigation, the employer was cited for failing to conduct or provide:
  - (1) a written permit-required confined space program;
  - (2) a hazard evaluation;
  - (3) adequate training; and
  - (4) protective equipment or clothing.

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Chapter 2: Safety Requirements

Areas of Exposure

A confined space has all 3 of the following characteristics:

- Is large enough and configured such that an employee can bodily enter and perform work; and
- Has limited openings for entry and exit; and
- Is not designed for continuous employee occupancy

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Chapter 2: Safety Requirements

Areas of Exposure

Permit Required Confined Space also has one or more of the following:

- Contains or has a potential to contain a hazardous atmosphere (gasoline vapors)
- Contains a material that has a potential to engulf occupant (soil, liquid)
- Contains inwardly converging walls or a floor that slopes downward
- Contains any other recognized serious safety or health hazard (unsafe temperature, electrical shock, corrosive chemicals)

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Chapter 2: Safety Requirements

Reference Terms

– Flammable vs. Combustible

- Class I = Flash point < 100° F = Flammable = Gasoline
- Class II = Flash point > 100° F = Combustible = Diesel

Flash point = Temperature at which a liquid gives off vapors sufficient to ignite

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Chapter 2: Safety Requirements

Reference Terms

- Individual Range of Exposure
  - PEL = Permissible Exposure Limit
  - REL = Recommended Exposure Limit
- Atmospheric Explosive Range
  - LEL = Lower Explosive Limit (Gasoline = 1.4% by volume)
  - UEL = Upper Explosive Limit(Gasoline = 7.6% by volume)

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Chapter 2: Safety Requirements

Excavations

- OSHA Definition
  - Excavation = any man-made cut, cavity, trench or depression in the earth's surface formed by earth removal.
  - Trench = a narrow, underground excavation that is deeper than it is wide and not wider than 15 feet

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Chapter 2: Safety Requirements

Excavations

Construction where excavations occur must meet OSHA rules

- Employees shall be provided with personal equipment for the protection of:
  - Head/Eyes
  - Nose/Lungs
  - Hands/Feet & other parts of the body
- If exposed to hazardous fumes or low oxygen
  - Respiratory protection
  - Atmosphere of excavations deeper than 4 feet must be monitored if workers enter
- No one permitted under loads
- Adequate access/egress must be provided if over 4 feet deep
  - Ladders must be within 25 feet of all workers
- Daily inspection of excavation for evidence of cave-in or slides

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Chapter 2: Safety Requirements

OSHA Safety Standards

- Eye Protection = Safety Goggles
- Head Protection = Hard Hat
- Foot Protection = Safety Toe Boots
- Ear Protection = Ear Plugs

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Chapter 2: Safety Requirements

OSHA Safety Standards

- Lead Hazards
  - Older tanks probably stored leaded gasoline
- Tank Cleaning
  - Any worker entering a tank should wear respirator and protective clothing
    - Respirator should be positive pressure – full mask
    - SCBA (Self Contained Breathing Apparatus)

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Chapter 2: Safety Requirements

OSHA Safety Standards

- Confined Space Entry
  - Confined Space
    - Not designed for continuous worker occupancy
    - Has limited openings for entry/exit
    - Has unfavorable or lack of natural ventilation
  - Confined Space Hazards
    - Oxygen deficiency
    - Flammable atmosphere
    - Toxic atmosphere

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Chapter 2: Safety Requirements

OSHA Safety Standards

- Standby Person
  - Must be present whenever someone enters a confined space
  - Must be able to see worker in confined space at all times
  - Backup person shall have no other duties
  - There must also be a third person on site available if needed
  - Backup person can't enter space until 3rd person is available

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Chapter 2: Safety Requirements

OSHA Safety Standards

- Site Safety Plan
  - General project information
  - Site waste characteristics
  - Hazard evaluation
  - On-site control procedures
  - Personal protective equipment
  - Decontamination procedures
  - Emergency procedures
  - Signatures

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Chapter 2: Safety Requirements

OSHA Safety Standards

- Fire Protection
  - Gasoline vapors heavier than air and will collect in low spots
    - Excavations
    - Sumps
  - Fire extinguishers
    - Size must be at least 40-60
      - » 40-60 refers to square footage of fire that can be covered
    - Rating must be BC dry chemical
      - » A = paper, wood
      - » B = flammable liquids
      - » C = live electrical
    - At least one per 3000 ft^2 of protected area
      - » Minimum of 2
    - Travel distance to reach must not exceed 100 ft

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Chapter 3: Release Reporting

- Release or threatened release of any petroleum product must be:
  - Verbally reported within 24 hours
  - Immediate action to prevent further release
  - Identify & mitigate fire, explosion, & vapor hazards
  - Written report within 7-10 days

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Chapter 3: Release Reporting

- Discovery of 1/8 inch or more of free phase product or in monitoring well

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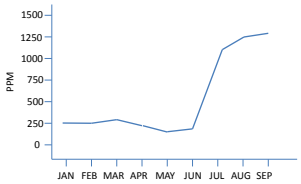
Chapter 3: Release Reporting

- "High" vapor readings in monitoring well



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Chapter 3: Release Reporting

- Automatic Tank Gauge indicates that a tank failed a monthly leak test

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Chapter 3: Release Reporting

- Electronic sensor alarms

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Chapter 3: Release Reporting

- Discovery of free phase product in any sump which may have resulted in a release to the environment

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Chapter 3: Release Reporting

- Two consecutive months of "failing" Inventory Control records
- SIR records "fail" or two "inconclusives"

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Chapter 3: Release Reporting

- Unexplained presence or sudden appearance of water in the tank

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Chapter 3: Release Reporting

- Automatic Line Leak Detectors "trip" and cannot be reset

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Chapter 3: Release Reporting

- Precision tightness test failure

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Chapter 3: Release Reporting

Discovery of free phase product or vapors in the soil, utility lines, sewers, or other areas

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Chapter 3: Release Reporting

- Spill/Overfill of more than 25 gallons

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Chapter 4: Temporary Closure

3 months or less

- Notify implementing agency
- Maintain leak detection unless tank is empty (1 inch or less)
- Maintain corrosion protection

> 3 months < 12 months

- Cap & secure all piping/risers except for vent lines
- Maintain leak detection unless tank is empty (1 inch or less)
- Maintain corrosion protection

>12 months

- Maintain leak detection unless tank is empty (1 inch or less)
- Maintain corrosion protection or permanently close
- Obtain extension (perform assessment)

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Chapter 3: Permanent Closure

Notify the implementing agency 30 days prior to closure

Removal from the Ground

- Tanks dug-up
- Assessment normally conducted after removal

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Chapter 3: Permanent Closure

Closure in Place

- Tanks left in place and filled with an inert solid material
  - Sand, concrete, "foam"
- Assessment normally conducted before tanks are filled
  - Must have approval from implementing agency

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Chapter 4: Removal from Ground

- Submit notice of intent to agency 30 days prior to closure
- Receive O.K. to proceed
- Have all underground utilities marked
- Excavate to top of tank
- Drain all product piping then cap or remove
- Remove all tank appurtenances except for vent line
- Remove all fluids from tank and clean
- Vapor free tank (purge or inert)
- Plug/cap all tank openings except for 1/8 inch hole
- Excavate
- Collect/analyze soil/groundwater samples
- Label and dispose of tank and piping

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Chapter 4: Removal from Ground

Safety Considerations

- Most important thing to consider when closing tanks
- Tanks are "bombs" waiting to explode
- Precautions
  - Eliminate all sources of ignition from the danger area
  - Prevent discharge of static electricity
  - Dissipate accumulations of vapors near ground level
  - Use combustible gas indicators to check for vapors
  - Ensure all electrical devices and hand tools are explosion proof

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Chapter 4: Removal from the Ground

Safety Considerations (cont'd)

- Tanks will continue to "breath" long after all the fuel and vapors are removed
- This is especially true on hot, sunny days
- This means the tank atmosphere must be checked and re-checked continuously

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Chapter 5: Closure In Place

Closure in Place Procedure

- Collect needed soil/groundwater samples
- Submit analyticals along with notice of intent to agency 30 days prior to closure
- Have all underground utilities marked
- Receive O.K. to proceed
- Excavate to top of tank
- Drain all product piping then cap or remove
- Remove all tank appurtenances except for vent line
- Remove all fluids from tank and clean
- Vapor free tank (purge or inert)
- Fill tank with inert solid material (sand, concrete, "foam")
- Plug/cap all tank openings

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Chapter 6: Sampling/Analytical Requirements

– 40CFR Part 280: Subpart G
  •Owners must measure for the presence of a release where contamination is most likely to be present at the UST site.

  •Sample types, locations and methods must consider stored substance, backfill, depth to ground water, etc.

– The following sampling protocols are conservative in nature and are a compilation of states' requirements since no specific protocols are spelled out in 40CFR Part 280.

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Chapter 6: Sampling/Analytical Requirements

Sampling Requirements for Permanent Closure by Removal

- Soil samples must be collected from the walls and the floor of the excavation
  - At least one soil sample from each wall of tank excavation
  - At least one soil sample from the floor for every tank
  - One floor sample per every 10 feet of piping trench
- Wall samples must be collected from the lower 1/3 of the tank diameter
- If excavation is large, wall samples must be collected every 25 feet
- If groundwater is present, wall samples must be collected from just above groundwater level and excavated soil as appropriate

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Chapter 6: Sampling/Analytical Requirements

Sampling Requirements for Permanent Closure by Removal (cont'd)

- Groundwater samples must always be taken when groundwater is above the level where soil samples are normally taken
- Groundwater samples may be required if tanks are within:
  - 500 feet of a private water well
  - 1000 feet of a public water well
  - A delineated wellhead protection area
  - A source water assessment area

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Chapter 6: Sampling/Analytical Requirements

Soil Sampling Requirements for Tank Closure in Place

- Soil borings on the outside perimeter of the tank pit, as close to tanks as possible
- At least one boring from each side of the pit (4 minimum) If pit is large, boring every 25 feet
- Two soil samples from every boring
  1. From the lower 1/3 of tank diameter
  2. From 5 feet below tank bottom
- One boring must be utilized to determine groundwater level.
  - This boring must have a third soil sample collected (at groundwater interface or total depth of 40 feet)

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Chapter 6: Sampling/Analytical Requirements

Groundwater Sampling Requirements for Tank Closure in Place

- Groundwater samples must always be taken when groundwater is above the level where soil samples are normally taken
- If groundwater is within 5 feet of tank bottom – 4 GW samples must be collected
- If groundwater is deeper than 5 feet – must collect one GW sample from 40' boring (if GW is present)

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Chapter 6: Sampling/Analytical Requirements

Soil Sampling/Analytical Requirements for Piping Closure in Place

- Soil borings every 10 feet in close proximity to piping/dispensers
- Boring utilized to determine groundwater level must also have a third soil sample collected (at groundwater interface or total depth of 40 feet)
- One soil sample from every boring no greater than one foot below burial depth of piping

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Chapter 6: Sampling/Analytical Requirements

Groundwater Sampling Requirements for Piping Closure in Place

- Groundwater samples must always be taken when groundwater is above the level where soil samples are normally taken
- If groundwater is within 5 feet of bottom of piping trench – 2 GW samples must be collected
- If groundwater is deeper than 5 feet – must collect one GW sample from 40' boring (if GW is present)

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Chapter 6: Sampling/Analytical Requirements

Analytical Requirements

Two options –

1. TPH (Total Petroleum Hydrocarbons)
2. COC (Chemical of Concern)

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Chapter 6: Sampling/Analytical Requirements

Soil Sampling Procedures

Collection, Handling, Preservation and Transportation must follow EPA protocols

Soil Samples must be collected using

- Clean soil collection apparatus for each sample
- Must wear gloves
- Gloves must be changed frequently
- Appropriate collection jars, syringes, vials
- Immediately placed on ice (4° C)and transported to lab
- Chain of custody must properly document custody

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Chapter 6: Sampling/Analytical Requirements

Handling of Petroleum Contaminated Soils

- Soils with less than 100 ppm TPH are not subject to management guidelines (must also determine lead levels)
- Soils with greater than 100 ppm TPH are considered contaminated – Must be "managed"
  - Must prepare and submit a soil treatment management plan
    - On site treatment
    - Off site treatment
    - Disposal at landfill
    - Incineration

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Chapter 7: Making Tanks Safe

Vapor Freeing Tanks

- The Fire Triangle

1. Oxygen
2. Fuel (flammable vapors)
3. Heat (ignition source)

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Chapter 7: Making Tanks Safe

3 ways to control fire hazards during permanent closure

1. Purging – Removing the fuel (flammable vapors) from within the tank atmosphere by venting with atmospheric air
2. Inerting – Displacing the oxygen within the tank atmosphere with a nonflammable gas (nitrogen or carbon dioxide)
3. Removing all sources of ignition

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Chapter 7: Making Tanks Safe

- Purging (controlling the fuel in the fire triangle)
  - Purging means to reduce/remove the flammable vapors
    - » Forcing atmospheric air into tank and displacing flammable vapors
    - » Must reduce vapors to 10 - 20% of LEL
    - » Must measure tank atmosphere with a combustible gas indicator (CGI) capable of displaying LEL %
    - » Because CGI's must have adequate oxygen to function, you must also monitor the oxygen levels in the tank

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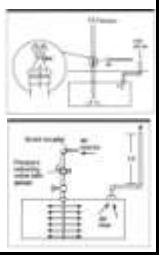
Chapter 7: Making Tanks Safe

- Purging
  - Purging is typically done with an eductor but can also use a diffuser
  - Must bond (ground) device to the tank to avoid static charges
  - Compressed air is forced into the tank
  - Air must be introduced at bottom of tank
  - Vapors are vented 12 feet above ground



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Chapter 7: Making Tanks Safe

- Inerting (controlling the oxygen in the fire triangle)
  - Inerting means to reduce/remove the oxygen
    - » Forcing nitrogen or carbon dioxide (dry ice) into tank and displacing oxygen
    - » To ensure safety, must reduce oxygen level to 6-7 % (normal "air" = 21% oxygen)
    - » Must measure tank atmosphere with an oxygen meter

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Chapter 7: Permanent Closure

- Inerting with compressed nitrogen
  - Must be introduced at the bottom of the tank
  - Must be introduced on the end of the tank opposite the end where the vent line is
  - Tank pressure must not exceed 5 psi
  - Nitrogen tank must be bonded (grounded) to tank

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Chapter 7: Making Tanks Safe

- Inerting with dry ice
  - Must be introduced across the entire bottom of the tank
  - 1.5 lbs per 100 gallons = 15 lbs per 1000 gallons (10,000 gal tank = 150 lb)
  - Cap all tank openings except vent
- When inerting is complete cap all openings
- One bung plug must have 1/8" vent

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Chapter 7: Making Tanks Safe

The excavation and the tank must be monitored/tested

- Purging = Combustible Gas Indicator & Oxygen Meter
- Inerting = Oxygen Meter
  - Tank must be tested at each end and in the middle
  - Excavation must be tested at top, middle and bottom

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Chapter 7: Making Tanks Safe

Testing Atmosphere for Explosive vapors

- Combustible Gas Indicators will not work properly in oxygen deficient atmosphere
- All instruments must be properly calibrated
  - In accordance with manufacturers requirements

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Chapter 8: Tank Cleaning

- "The tank(s) were cleaned in accordance with API Bulletin 2015 'Cleaning Petroleum Storage Tanks'?"
- "If no, describe how tank(s) were cleaned"
- "Provide an estimate of the volume of sludge removed from the tank: _____ gallons"
- "Indicate the final destination of the sludge and attach invoices or receipts"